Biochemistry of Plants, a Comprehensive Treatise

Editors-in-chief P. K. Stumpf and E. E. Conn
Academic Press; London, New York, 1980

Vol. 1 The Plant Cell (editor N. E. Tolbert) xvi + 705 pages. $65.00

Vol. 2 Metabolism and Respiration (editor D. D. Davies) xii + 687 pages. $65.00

Vol. 3 Carbohydrates, Structure and Function (editor J. Preiss) xvi + 644 pages. $65.00

Vol. 4 Lipids, Structure and Function (editor P. K. Stumpf) xiv + 693 pages. $65.00

Volumes 1–4 above are the first of an eight-volume set which aims to provide a comprehensive account of Plant Biochemistry. Since this important area of Biochemistry is dealt with very poorly in general textbooks, such a series is a welcome addition to the reference shelves of libraries. Individual volumes might well be purchased by research workers in a particular area.

Volume One is entitled 'The Plant Cell', and it is in general excellent. Separate chapters deal with generalised cell structure (Newcomb) and then with the individual organelles, namely cell-walls (Darvill et al.), plasma membrane (Leonard and Hodges), mitochondria (Hanson and Day), the cell nucleus (Jordan et al.), protein bodies (Lott), central vacuoles (Marty et al.), microbodies (Tolbert), endoplasmic reticulum (Chrispeels), ribosomes (Davies and Larkins) and Golgi apparatus (Mollenhauer and Morre). There is also a chapter on Plant Cell Cultures (Ludden and Carlson) and one on the cytosol (Kelly and Latzko), a metabolic 'compartment' that is often ignored. The development of plastids and mitochondria is reviewed by Schiff, whilst Jensen gives a general account of chloroplast metabolism. It is obviously impossible to do justice to this organelle in a single chapter, but volume 8 in the series is intended to deal with photosynthesis in detail. The last chapter in volume 1 (by Volk) covers the blue–green algae.

Volume 4 is a very useful compendium of information about plant lipids. At the beginning, Harwood reviews plant fatty acids and acyl lipids. Raison then reviews lipids in relation to membrane structure. Galliard gives an account of the various lipase and lipoxygenase enzymes found in plants, which leads on to a discussion of ethene synthesis (Yang and Adams). There are chapters on fatty acid biosynthesis (Stumpf), triacylglycerol synthesis (Gurr), phospholipids (Mudd), phospholipid exchange between membranes (Mazliak and Kader), sulpholipids (Harwood), galactolipids (Douce and Joyard), terpenoids (Loomis and Croteau), carotenoids (Spurgeon and Porter), waxes and cuticle lipids (Kolattukudy) and cyclic fatty acids (Mangold and Spencer). Beevers discusses the glyoxylate cycle, although this chapter overlaps somewhat with that by Tolbert in volume 1.

In general, I was impressed by volumes 1 and 4 and I would recommend them highly. The chapters are, on the whole, well-written by experts in the various fields. In volumes 2 and 3 the chapters are again written by expert authors, but I was less impressed with the final products. Volume 2 aims to cover 'metabolism and respiration', other than photosynthetic metabolism, whereas volume 3 deals with the structure and function of carbohydrates. In principle, I would have thought that structure should come before metabolism. This makes little difference in practice, since there is extensive overlap between the two volumes. In volume 2 Ap Rees discusses plant respiratory pathways in general, and in volume 3 he gives an overlapping account of hexose sugar metabolism. His chapter in volume 2 is followed by a rather theoretical account of allosteric enzymes (Ricard), which uses plant enzymes for illustration wherever possible. Dougall reviews the use of tissue cultures in metabolic studies, West gives an account of hydroxylases, including those dependent on cytochrome *P*-450, and Butt describes the direct oxidases such as ascorbate oxidase, phenolase and laccase. The major meta-

bolic pathways are then described; the Krebs cycle by Wiskich, glycolysis and the oxidative pentose phosphate pathway by Turner and Turner, folate metabolism by Cossins and photorespiratory carbon metabolism by Tolbert, although this chapter overlaps extensively with that by the same author in volume 1. Volume 2 also contains two chapters on plant mitochondria, one on energy coupling (Storey) and the other on cyanide-sensitive respiration (Day et al.), which are reasonably well integrated with each other and with the chapter on mitochondria in volume 1. Rhodes reviews respiratory activity during plant senescence and Uritani and Asahi that during wounding and infection of plant tissues. Graham discusses the effect of light on dark respiration, since the rate at which the Krebs cycle and oxidative pentose phosphate pathway produce CO_2 in the light has to be taken into account in most of the methods used to measure photorespiration rates. This chapter, and that by Tolbert, might well have been complemented here by a chapter on the various methods used in studies of photorespiration. D. D. Davies gives an account of anaerobic respiration and the production of organic acids in plant tissues, and finally Raison describes the effect of temperature on respiration rates.

In volume 3, several of the articles clearly belong to a 'structural' volume, namely the chapters on cell-wall polysaccharides (Aspinall), on *myo*-inositol and ascorbic acid (Loewus), on branched-chain sugars (Grisebach), on oligosaccharides (Kandler and Hopf), on starch (Banks and Muir), on polysaccharide conformation (Bryant), on glycoproteins (Lamport), on glycolipids (Elbein) and on cellulose (Colvin). The chapters on sucrose metabolism (Akazawa and Okamoto), starch degradation (Preis and Levi) and sugar nucleotides (Feingold and Avigad) probably belong in volume 2.

Overall, volumes 2 and 3 are valuable reference sources, although I feel that the attempted separation of structure from metabolism has not succeeded and it might have reduced overlap to have dealth with the topics in a more integrated fashion.

This is a useful series, which I shall certainly recommend to our own library. Further volumes deal with amino acids and their derivatives (volume 5), nucleic acids and proteins (volume 6) and secondary plant products (volume 7). I look forward to seeing them in the near future.

B. Halliwell

Chemical and Biochemical Aspects of Superoxide and Superoxide Dismutase

Developments in Biochemistry: Volume 11A

Edited by J. V. Bannister and H. A. O. Hill
Elsevier/North-Holland; Amsterdam, New York, 1980
x + 414 pages. Set: (A,B) $80.00; Dfl 164. Single: $45.00; Dfl 92.50

The Second International Symposium on Superoxide and Superoxide Dismutases held in Malta, 1979, has been presented as a collection of articles in 2 volumes. This volume as the title suggests contains an assortment of papers describing chemical and biochemical aspects of the metallo-enzyme and its substrate. Although much of the basic science of oxygen radicals and transition metal interactions is not entirely new to the inorganic chemist and physicist, its re-discovery and application to the life sciences has been an exciting process. The single catalyst which brought together so many scientists with such varied backgrounds to discuss oxygen, unpaired electrons, transition metals and protein structure, was the discovery some 14 years ago of an enzymic role for the intracellular cuproproteins. These proteins, now known as superoxide dismutases, occur in nature wherever oxygen is utilised and are unique in having an inorganic free-radical as a substrate. The extremely rapid progress in this field during the last few years is